

**CGIAR ECO-REGIONAL COLLABORATIVE
RESEARCH PROGRAM FOR SUSTAINABLE
AGRICULTURAL DEVELOPMENT IN CENTRAL
ASIA AND THE CAUCASUS**



***COMMON VISION FOR SURMOUNTING
CHALLENGES***

**ANNUAL REPORT
(2006-2007)**



Kazakhstan



Kyrgyzstan



Tajikistan



Turkmenistan



Uzbekistan



Armenia



Azerbaijan



Georgia

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INTRODUCTION

The CGIAR Consortium for Sustainable Agricultural Development in Central Asia and the Caucasus, involving nine CG Centers - CIMMYT, CIP, ICARDA, ICRISAT, IFPRI, ILRI, Bioversity International (former IPGRI), IRRI, IWMI, and three other institutions - AVRDC, ICBA and MSU, has been serving the eight National Agricultural Research Systems (NARS) of Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan since September 1998 through the Eco-Regional Collaborative Research Program for Sustainable Agricultural Development in Central Asia and the Caucasus. The goal of the Program is to achieve increased productivity through generation and transfer of sustainable agricultural production technologies, while ensuring protection of natural resources.

The GCIAR Program Facilitation Unit (PFU-CGIAR) provides support to the Consortium partners for the conduct of their research activities. ICARDA is the Lead Center in the Program. Other Centers are gradually expanding their collaborative research activities.

The program has made considerable progress over the last nine years in the following areas:

- 1) Genetic Resource Conservation;
- 2) Germplasm Enhancement and Crop Diversification;
- 3) Efficient Soil and Water Management;
- 4) Strengthening of NARS.

This report highlights, in brief, various activities undertaken by the Consortium partners during the period of April 2006-April 2007. The Consortium Partners will report in detail on their respective components in their presentations during the Program Steering Committee Meeting.

1. GENETIC RESOURCE CONSERVATION

Success of the activities on genetic resources conservation in CAC region is gaining momentum in view of the progress achieved recently with national Gene Banks, especially in the framework of the projects on "Improving the facilities of Gene Banks in the CAC region" funded by the Global Crop Diversity Trust and ACIAR-funded project on "PGR Conservation, Documentation and Utilization in Central Asia and the Caucasus" (GCDT). At presents all Gene Banks in CAC countries are functional.

In Armenia, the Ministry of Agriculture has allocated \$US 14 000 for renovation of National Gene Bank at the Agrobiotechnology Scientific Center. Gene Bank was renovated and now 430 accessions are stored. ICARDA-CAC and PFU-CGIAR are providing necessary technical backstopping to the facility, including a dehumidifier, an electronic balance, deep freezer,

¹ Presented by Dr. Surendra Beniwal, Acting Head, CGIAR-PFU, at the Tenth CGIAR Program Steering Committee Meeting, held in Dushanbe, Tajikistan on 29-30 May, 2007.

aluminum seed containers, seed germinator, and other supplies. It is expected that considerable assistance will also be received from the USDA.

Gene bank at the Research Institute of Farming of Azerbaijan, which has accumulated its first 350 accessions last year, was further strengthened. It received funding to purchase a much needed dehumidifier. At the same time, a medium-term Gene Bank is now fully operational in the Azerbaijan Research Institute of Genetic Resources, where currently 5,497 accessions are stored.

A functional small Gene Bank facility was opened in 2006 in Krasniy Vodopad Breeding Station in Southern Kazakhstan as a result of the collaboration between South West Scientific Production Center, Kazakhstan, ICARDA-CAC and PFU-CGIAR. ICARDA and PFU provided the support for necessary materials and equipment – plastic bottles, storage shelves, tables, electronic balance, refrigerator, computer, etc. Currently, the Gene Bank contains about 250 of the total 2,000 valuable indigenous collections of cereals and legumes.

A new medium-term storage Gene Bank was opened at the Research Institute of Farming in Almaty, Kazakhstan, during the National Workshop on Plant Genetic Resources on 30 March, 2007. Renovation and equipment of this small but functional facility was supported by the regional office of ICARDA-CAC. This new Gene Bank will store an important collection of 11,874 accessions of more than 20 different agricultural crops.

In Turkmenistan, necessary office and lab equipment as well as furniture have been provided and partitions have been installed in the Turkmenistan Gene Bank. In addition, the Gene Bank was also provided with a dehumidifier, seed moisture meter, two deep freezers, seed germinator, seed containers, a standby generator, and other supplies. Thus, now it has become fully functional, where currently more than 600 accessions of wheat and barley are stored.

A new Gene Bank specialized on salt tolerant crops is being established in Gulistan State University of Uzbekistan. During the last two years, this university has been actively involved in evaluation of germplasm provided by international centers, including ICARDA, ICBA, CIMMYT, AVRDC, CIP and ICRISAT. When fully renovated and reequipped to provide necessary storage conditions, this new facility will host a rich collections of salinity –tolerant germplasm from the whole region.

National Coordinators of the Plant Genetic Resources Network from eight CAC countries gathered to finalize the Regional Strategy for Conservation and Use of Plant Genetic Resources for Food and Agriculture on March 2007 in Tashkent, Uzbekistan. The reviewed Regional Strategy specified the following priority areas: 1) *In-situ*/on-farm conservation of plant genetic resources; 2) Capacity building and further development of safe conservation measures for *ex-situ* collections of cultivated plants and their wild relatives; 3) Efficient study and sustainable use of PGR; and 4) Development of technical possibilities and enhancement of scientific potential for conservation and sustainable utilization of PGR. After discussions the Strategy was approved by all participants.

Under the regional program for long-term support of *ex-situ* collection, GCDT is supporting two small-scale projects in the CAC region which are aimed at: (i) completing national accession level inventories (Inventory Project), and (ii) development of a Regional PGR Information Network (Information Network Project).

A Technical Meeting on “CAC Regional Inventory and PGR Information Network” was held in Tashkent from 16-20 April 2007. A total of 19 scientists from seven CAC countries

(representatives of Turkmenistan did not attend) as well ICARDA scientists participated in the Meeting. The harmonized/standardized drafts of inventories (National Databases) based on copies of databases received from countries were reviewed and improved during the meeting. As a result, it was identified that there are 123751 *ex-situ* accessions of agricultural crop in the CAC countries, including Armenia – 5173, Azerbaijan – 8139, Georgia – 1934, Kazakhstan – 45421, Kyrgyzstan- 1010, Tajikistan – 2940, Turkmenistan – 999, and Uzbekistan – 58375.

A joint collection expedition in Tajikistan was organized by ICARDA PGR program in CAC in collaboration with specialists from the Academy of Agricultural Sciences of Tajikistan. A total of 11 participants from five countries took part in the expedition from 19 June-3 July 2006 in Sogd province. From 59 locations, a total of 317 samples of various aboriginal cereals, leguminous and fodder crops and their wild relatives were collected. Some unique samples of wheat, barley and wild forms of chickpea have also been added to the collection.

In 2006, significant progress was made in the implementation of the UNEP/GEF-supported project on “*In situ* conservation of crop wild relatives through enhanced information management and field application”. This project addresses national and global needs for food security through effective conservation and use of crop wild relatives, and involves Armenia and Uzbekistan in the CAC Region, as well as Bolivia, Madagascar, and Sri Lanka outside the CAC region. One of the most significant achievements was that all five partner countries forged an agreement to use and share a common national information system, the Genetic Resources Information System (GRIS). Bioversity International is leading the development of GRIS, which will be used in other projects. In addition, field assessments of priority CWR taxa have been undertaken and development conservation actions are being conducted successfully.

A project on “Securing important field collections of apple genetic resources in Kazakhstan and Turkmenistan”, started in 2005 with the support of Global Crop Diversity Trust, aims at improvement of the management of field Gene banks in the Makhtumkuli Research and Production Center on Plant Genetic Resources in Turkmenistan and the Pomological Gardens in Kazakhstan, as well as establishment of communication and germplasm exchange between the institutions and the larger scientific community and farmers. In addition, the project implemented by Bioversity International, makes the information on the apple accessions conserved in these collections widely available to users and other target groups. In 2006 maintenance of these two collections was considerably improved, work on filling gaps in accessions’ evaluation data and establishment of computerized data base was started. Farmers’ visits to the collection were organized and their knowledge on apple accessions conserved in these field Gene banks, their morphological traits and gustatory quality of fruits were increased.

A Project on “Strengthening socio-economic and cultural institutions to support agrobiodiversity management for development in Tajikistan and the Kyrgyz Republic” (2005-2007), supported by the Christensen Fund and implemented by Bioversity International aims to understand the impacts of socio-economic and cultural institutions on biodiversity resources and agrarian communities under transition, and to identify actions, practices and policies to increase the contribution of biodiversity to social and economic development in Central Asia. The project is contributing to sustainable agricultural development in the region, more secure livelihoods and greater well-being for rural communities in Tajikistan and the Kyrgyz Republic through improved partnerships and more optimal and sustainable use of agricultural biodiversity.

2. GERmplasm ENHANCEMENT AND CROP DIVERSIFICATION

Research activities on germplasm enhancement have focused on testing and identifying most promising breeding materials with resistance to both biotic and abiotic stresses. Under this collaborative program, 27 new promising varieties consisting of winter wheat (14), triticale (2) spring barley (2), chickpea (4), lentil (1), lathyrus (1), soybean (1) and groundnut (2) have been released in the region. These varieties have recorded consistently higher yield with superior quality and disease resistance over the local checks. Some of them are now covering large areas and getting popular with the farmers (Annex I)

Winter wheat improvement

The first CAC trials of wheat initiated in the fall 2005 showed encouraging results in 2006. These trials included 46 varieties of wheat from the Central Asian countries. The results of the yield harvested in June 2006 revealed a very good performance of a new variety of wheat Matonat from Uzbekistan. Wheat varieties Bitarap from Turkmenistan, Chilgazy-36 from Tajikistan, Jetisu from Kazakhstan, and Keremet from Kyrgyzstan also showed good yield potential. National Field Day was organized to demonstrate these varieties to farmers and breeders in Kazakhstan in June 2006 involving more than 70 participants.

A new variety of wheat has been released in Armenia under the name of Armcim. This variety has been selected from the 12th FAW WON (facultative and winter wheat nursery). Being cold tolerant and resistant to fungus diseases, this variety is suitable for growing in Ararat Valley and its foothill zone. The average yield of Armcim variety is 7.2-8.2 t/ha.

The State Variety Testing Commission (SVTC) of Uzbekistan has included two wheat varieties Durdona and Saidaziz into the pre-release list. These two promising high yielding varieties, with good grain quality and disease resistance were selected from international nurseries. The Saidaziz variety was selected by the Tashkent Branch of Andijan Research Institute of Grain in 2002, whereas Durdona was selected by scientists of the same institution stationed in Andijan in the same year.

Two new bread wheat varieties were released recently in Tajikistan. These new varieties under the local names “Norman” and “Alex”, have shown good results both in terms of yield and stress tolerance during seven and five years of trials, respectively. Starting from this year, “Norman” and “Alex” joined 12 wheat varieties released in CAC that originate from the internationally supplied germplasm. In Azerbaijan, a new variety of bread wheat Qobustan was released.

In addition, three bread wheat varieties Oriyon in Tajikistan, Hans and Petr in Kyrgyzstan, and two varieties Miras and Anew in Turkmenistan were submitted to the SVTC in 2006 for evaluation and further release. A new variety of triticale Ruhnoma was also submitted to the SVTC in Turkmenistan in 2006.

Other CIMMYT initiatives. In addition to joint Turkey-CIMMYT-ICARDA program activities reported above, CIMMYT initiatives in the region cover a number of areas, concentrating mainly on improvement and introduction of spring wheat varieties as well as conservation agriculture.

Kazakhstan-Siberia Network on Spring Wheat Improvement (KASIB) was established in 2000 with the objective to improve efficiency of spring wheat breeding in northern Kazakhstan and in Siberia through exchanging varieties, breeding materials, coordinated assessment of materials, exchanging information, meetings and discussions. KASIB unites 14 breeding institutions from

Kazakhstan and Russia. Results of studies of 2005 nurseries of bread and durum spring wheat (7th KASIB-BSW and 7th KASIB DSW) were analyzed and summarized in 2006. Nurseries contained 35 samples of bread wheat and 17 samples of durum wheat. At present, all members of the KASIB network have provided the grains harvested in 2006 for further technological analysis, along with yields and other data obtained this year.

Shuttle Breeding between Kazakhstan and CIMMYT-Mexico was established in 2000. The crossing program conducted in Mexico emphasizes Kazakh x Mexico crosses as well as top crosses with the relevant US and Canadian germplasm. The shuttle breeding reached its full potential by 2005 with almost 1,000 entries coming annually to Kazakhstan and Siberia. In 2006, the results of the study of 4th Shuttle Breeding Nursery were obtained. The nursery included 114 breeding lines and hybrid populations. In addition, nine stations in Kazakhstan and Russia have studied in 2006 the 5th Shuttle Breeding Nursery which was compiled based on the breeding material selected from the 2005 nurseries. In order to compile the 6th Shuttle Breeding Nursery, entries have been selected.

In 2006, biofortification activities on iron and zinc content in wheat were continued in evaluation of genotype x environment interaction for Fe & Zn in spring and winter wheat, genotype x technology interaction to define optimal agronomy practices and screening environments for high Fe & Zn content, as well as in diversity of spring and winter wheat germplasm for Fe & Zn content.

Barley improvement

The first CAC trials of barley initiated in the fall 2005 showed encouraging results in 2006. These trials included 20 varieties of barley from the Central Asian countries. Among tested varieties, YlanMES and Tamara from Kyrgyzstan, Atamerken and Zhibek zholy from Kazakhstan, Bolgaly from Uzbekistan and Sana from Turkmenistan demonstrated high yields. All these varieties also possess lodging and disease-resistant traits. National Field Day was organized to demonstrate these varieties to farmers and breeders in Kazakhstan in June 2006 involving more than 70 participants.

In 2006, Uzbekistan received eight nurseries containing 747 lines of barley from ICARDA and 200 lines from CIMMYT. Based on research results of the first year trials conducted in quarantine nursery, 128 promising lines with good yield potential have been selected. All of them out-yielded the local check Mavlona, providing more than 450 grams yield per m². Lines in two nurseries, IBYT-W and IBYT-LRA-C, have shown exceptionally good performance and, therefore, 45 out of 48 lines were included in the evaluation trials to be carried out next year in different provinces of Uzbekistan.

A new barley variety Adel was released in 2006 in Kyrgyzstan. The new variety was selected by Kyrgyz breeder Dr. Tamara Bessonova five years ago from ICARDA materials. During the last four years, it was under SVTC evaluation and showed better yield potential and earlier maturity than the local variety Osnova.

A new barley variety Jibek Jjoly has shown a good yield potential, resistance to drought, and large seed size during the SVTC evaluation in Kazakhstan. It is expected that this new variety will be released during the next cropping season. In addition, new barley variety Tilek was submitted to the SVTC of Kazakhstan in 2006.

Two other barley varieties, namely, Qarabach-33 and Nozik Tam, were submitted to the SVTC in 2006 in Azerbaijan and Uzbekistan, respectively. Currently, 12 new promising barley varieties

selected from ICARDA nurseries are being tested by the SVTCs in CAC region, and are awaiting decision for their release and wide scale adoption.

Legume improvement

Food legumes

With the current land reforms and the emergence of small farm units, the role of alternative crops to replace the monoculture practice becomes very important. Introduction of alternative crops will facilitate the diversification of agriculture. Several alternative crops have been identified, as, chickpea, lentil, buckwheat and field peas that might be more profitable than wheat and, therefore, have potential for wide-scale adoption in future.

Chickpea

Crop diversification through introduction of food legumes in the CAC region is becoming more and more popular. In Kazakhstan, farmers have increased area under chickpea. In northern Kazakhstan, where chickpea had never been grown before, successful results have been achieved in introducing chickpea in collaboration with the Research Institute of Grain, which receives annually about 300 lines of food and forage legumes from ICARDA. From the received materials, Janalik chickpea variety was selected and submitted to SVTC for future release in northern part of Kazakhstan. On-farm trials of chickpea in Krasniy Vodopad station yielded very promising results, especially in increasing farmers' income. In addition, one new variety of chickpea Tassai was submitted to the SVTC of Kazakhstan in 2006.

New varieties of chickpea Malhotra and Halima have been submitted to the SVTC in Uzbekistan in 2006 by Prof. H. Atabaeva. These varieties, selected from ICARDA breeding lines, are the result of trials performed in saline soils of Mirzachul region. During the last three years, these have shown good yield potential and salinity tolerance.

Food legume breeders of Armenia have submitted four chickpea varieties, namely, Asavan (FLIP-97-130), Sisian (FLIP-98-22), Lilit (FLIP-98-16), Alina (FLIP-99-34), to the SVTC in 2007. The new varieties show high resistance to various stresses, including cold, drought and diseases. All these varieties have been selected from ICARDA nurseries.

In Tajikistan, a new variety of chickpea Kandbaland (Tall) selected from ILC 32-79 line was submitted to the SVTC in autumn 2006.

Similarly good results have been achieved in chickpea trials in Turkmenistan and Azerbaijan. In Azerbaijan, a new variety of chickpea Sultan-FLIP-98-178 was submitted to the SVTC in 2006.

Lentil

A three-year testing of a promising lentil variety named Orzu is being performed by lentil breeders of Azerbaijan. This new variety was identified as promising and submitted to the SVTC in 2003. Based on the results of this testing, Orzu has recently been included in the list of the pre-released varieties. Seeds for this new lentil variety were produced by Dr. Lutfiar Amirov.

Four lentil trials: LICTN-06, LIDTN-06, LIEN-S and LIEN-L-06 were studied in Armenia in 2006. In total, 54 lines were selected for further evaluation. Selected lines showed good yield potential, taller plant height suitable for mechanization, and resistance to lodging.

In Tajikistan, lentil line ILL 1005 was submitted to the SVTC under the name Donakolan (big seed) in autumn 2006.

Forage crops

Livestock is an integral part of the farming systems and the problem of forage and feed is quite acute in this region. This can be solved with the introduction of forage legumes in the existing crop rotations. The collaboration of ICARDA with NARS has resulted in identification of some promising materials.

Legume breeders of Armenia have tested three forage legume trials: IVAT-VE 2006 (International Vetch Adaptation Trial- *Vicia ervilia* 2006), and IVAT-VN 2006 (International Vetch Adaptation Trial- *Vicia narbonensis* 2006), IVAT-VS 2006 (International Vetch Adaptation Trial- *Vicia sativa* 2006) in 2006. As a result, 16 promising lines have been selected. The selected lines showed good yield potential and large seed size.

Potato improvement

In the CAC region, the introduction and testing of elite potato breeding materials is a priority as many NARS plan to locally produce their own basic seed so as to reduce dependence on seed imports from foreign countries. For this, the International Potato Center (CIP) has started a threefold strategy with the supply of elite potato clones, TPS (True Potato Seed) and advanced TS (True Seed) families, to satisfy short, medium and long-term needs, respectively. The Short-term strategy involves multiplication of elite breeding lines supplied *in-vitro*, Mid-term strategy is targeted at adaptation of TPS (True Potato Seed) to local conditions, whereas Long-term strategy consists of regional clonal selection.

In addition, for strengthening formal and informal seed systems in CAC, CIP has focused activities in two areas: (i) the strengthening of tissue culture technology, and (ii) the development of new techniques and practices that should be prerogative of the informal seed system. Different techniques for seed potato production have been tested, including an original variant to produce rooted seedlings from TPS materials under nursery conditions.

Work on Potato Biofortification was focused in two countries of the region, Uzbekistan and Kyrgyzstan. Potato is an important co-staple and also a valuable source of bioavailable minerals in diets. Thus, CIP has undertaken a study in Uzbekistan to analyze the content of Fe and Zn in predominant, locally-cultivated, potatoes as a means to determine a breeding strategy for the supply and test of improved varieties in Central Asia. The study determined that the iron content of varieties Picasso and Nevskiy was significantly higher ($p < 0.01$) than that of the other tested varieties, with respectively 17.5 and 17.0 mg/kg on a dry weight basis. In Kyrgyzstan, on the other hand, in collaboration with the Agha Khan Foundation (AKF) project based in Osh, data on consumption patterns and nutritional status have been collected from two districts of Osh region to measure the present contribution of potato to the diets of populations at risk of malnutrition and to study post-harvest utilization of produced potatoes.

Vegetable crops

AVRDC (Asian Vegetable Research and Development Centre) Regional Varietal Trial was conducted in 2006 in different soil and climatic conditions in six locations in four countries of the region, including Azerbaijan (Azerbaijan Research Institute of Vegetable Growing and its Lenkoran Zonal Experiment Station), Kazakhstan (Kazakh Research Institute of Potato and Vegetable Farming), Turkmenistan (Research Institute of Crop Husbandry), and Uzbekistan

(Uzbek Research Institute of Plant Industry and Mamun Academy). A total of 21 promising lines from AVRDC were studied, including seven of tomato, four of hot pepper, sweet pepper, and six of vegetable soybean.

The Research Institute of Crop Husbandry of Armenia conducted a study on 100 varieties and lines of 5 vegetable crops (tomato-20, cucumber-20, eggplant-20, mungbean-20 and soybean-20). Uzbek Research Institute of Plant Industry conducted a trial of 107 new accessions of nine vegetable crops, including carrot-1, cauliflower-2, Chinese cabbage-11, eggplant-10, mungbean-14, sweet pepper-22, tomato-30, vegetable soybean-13, and yardlong bean- 4.

Number of promising lines of these crops were identified in each country and seeds were multiplied for conducting a competitive large trial. In 2006, promising lines (4 of vegetable soybean, 2 of mungbean and 2 of hot pepper) were submitted to SVTC in Uzbekistan. An early maturing variety Ilkhom of non-traditional crop vegetable soybean was released in Uzbekistan.

Groundnut improvement

After undergoing evaluation by the SVTC, ICGV 86155 as ‘Salomat’ and ICGV 94088 as ‘Mumtoz’ were officially released in Uzbekistan. The results of evaluation by the State Varietal Testing Commission of ICGV 94016 and ICGV 96066 in Tajikistan and ICGV 93143 in Azerbaijan are awaited.

In May 2006, two sets of the Tenth International Short-duration Groundnut Varietal Trial (X ISGVT) were supplied for distribution in the region.

Halophytes for saline-affected soil

International Center for Biosaline Agriculture (ICBA), along with ICARDA and IWMI, is involved in collaborative research activities in Kazakhstan, Uzbekistan and Turkmenistan since 2004 under the ADB-funded project on “Bright’ Spots”. Within the framework of this project, ICBA–CAC activities in 2006 were targeted at evaluation of new germplasm of wild halophytes and conventional and non-conventional salt-tolerant crops in the three participating countries. The activities included also selection of salt-tolerant forage crops and integrated management in salt-affected farming areas.

An additional study has been initiated in the marginal lands of sandy saline Kyzylkum Desert of Uzbekistan in close collaboration with the Uzbek Research Institute of Desert Ecology and Karakul Sheep Breeding. The focus of this activity was to assess the feasibility of using of non-conventional water resources (artesian mineralized source) for cultivation and domesticating of wild halophytes that could be used as fodder species.

Germplasm of 26 varieties of pearl millet (*Pennisetum glaucum*) and 14 improved lines/accessions of Sorghum (*Sorghum bicolor*) provided by the International Center for Biosaline Agriculture (ICBA) were evaluated using 15 agro-biological characteristics.

In 2006 ICBA-CAC jointly with IWMI & ICARDA in collaboration with NARS groups imitated an activity towards the management and remediation of saline-affected lands by improvement of seed production and seed multiplication at the local level. This activity also included training and consulting farmers on seed ecology and biology of germination, as well as seed production for further dissemination among farmers, mainly, under saline environments of Syrdarya province.

Temperate rice

Temperate Japonica rice is predominantly grown in all five countries of Central Asia, with a common constraint of cold damage at vegetative as well as reproductive stages. Blast disease problem is also encountered in some countries. IRRI-Korea temperate rice research program focuses on development of elite germplasm with cold tolerance and blast resistance. IRRI has identified cold-tolerant recombinants for seedling as well as reproductive stages. These recombinants express tolerance to low temperature (10 °C) at seedling stage and also have high fertility at reproductive stage when irrigation water temperature is 16-18°C. These recombinant lines are multiplied at IRRI and seeds will be provided to breeders of Central Asian countries starting this year. IRRI also has identified a new resistance gene for blast disease that has broad-spectrum resistance to blast isolates of Korea. This resistance gene has been incorporated into several Japonica cultivars and improved Japonica breeding lines have been developed. These lines will also be shared with breeders of Central Asian countries to help them broaden the gene pool of Japonica rice with increased yield potential.

IRRI and the Rural Development Administration (RDA) of Korea recently established the Temperate Rice Research Consortium (TRRC) initiative. This Consortium will develop a research network among the temperate Japonica rice growing countries as well as strengthen rice improvement in Central Asia.

Regional rice nurseries consisting of best rice varieties from Azerbaijan (4), Kazakhstan (2), Kyrgyzstan (2), Tajikistan (2) and Uzbekistan (4) were sown this year in each of these countries with the assistance of CGIAR-PFU. Preliminary results on the best rice variety trials initiated by the CAC Rice Regional Network were obtained from Uzbek Rice Research Institute. Fourteen best rice varieties from the countries of CA region were planted in Uzbekistan, Kazakhstan, Kyrgyzstan, Tajikistan and Azerbaijan in the spring of 2006. The varieties from Kazakhstan proved to be the most early-maturing and varieties from Uzbekistan were high yielding. The Uzbek Rice Research Institute has also evaluated 242 accessions of rice received from IRRI. Of these, 144 were of irrigated rice and 98 of upland rice.

The activities of the CAC Rice Regional Network will continue in subsequent years. Iran now joined as a member of the network and also contributed few varieties to be included in the network testing for this year. Materials selected from INGER nurseries as well as those contributed by member countries will be shared with the network members for local evaluation and for potential release. Under the activities of INGER-CAC 2006, a total of 502 entries were shared with three countries in the region during 2006. These include: 242 entries sent to Uzbekistan, 126 to Kazakhstan and 136 to Turkmenistan.

IRRI is working towards the development of human resources in CAC to increase the impact of rice improvement programs. Several scientists were trained at IRRI and through the Rice Technology Transfer Systems (RTTS) annual training workshop at RDA of Korea. IRRI is planning to accommodate at least one scientist from the region to participate in the RTTS course to be conducted on 5-8 August 2007 in Korea. IRRI is also continuing its efforts, together with other CG centers, to target funding opportunities for research and also to help in training, capacity building and to facilitate interaction with the international community.

Seed production

Production of quality seed of high-yielding varieties is critical for faster varietal dissemination. Hence, special emphasis has been laid on the seed development activities in the region. On-farm

trials and demonstration plots turned out to be the most important activity for increased agricultural production. The scientists and farmers are now keen to test new varieties. To have an impact on farmers' fields and for wide spread of promising varieties, efforts have been directed towards seed multiplication in collaboration with NARS partners. Details of the seeds of new varieties multiplied in the region are provided in this report in Annex I.

Integrated pest management

Integrated disease and pest management is an important part of germplasm improvement program. Scientists from ICARDA have studied the overall situation for controlling yellow rust – being the most important wheat disease in the region.

Identification of physiological races of yellow rust was undertaken in Azerbaijan, Kyrgyzstan and Uzbekistan. Data for mapping the distribution frequency of new races and the effective resistance genes to yellow rust have been undertaken. Recommendations for replacement of varieties susceptible to yellow rust have been made in view of release of new high yielding disease resistant winter wheat varieties in different countries under the existing research collaboration.

USAID is sponsoring a Collaborative Research Support Program (CRSP) for Integrated Pest Management in Central Asia. This project is designed to foster development of a comprehensive IPM initiative, using an ecologically-based and multidisciplinary system approach. ICARDA and Michigan State University, USA were implementing this collaborative and participatory research-education program, designed to facilitate capacity building in IPM in Central Asia. The objectives of the IPM Project are: 1) Landscape ecology to enhance biodiversity and biological pest management; 2) Enhance efficiency, products line and crop usage of Central Asian biolaboratories; and 3) Develop and implement IPM extension/outreach and university education programs.

In 2006, under this project, researches on nectar plants were started in Tajikistan and Kyrgyzstan, native plant collection missions were organized for enhancing research on role of native plants for conserving natural enemy communities and biological control of crop pests in Tajikistan and Kyrgyzstan, an electronic database for IPM publication was developed, several brochures and leaflets were prepared. A "Training for Trainers" (ToT) and FFS was started in Tajikistan in early 2007. This short-term ToT program finished in March 2007. The full course of FFS in Tajikistan will be finished at the end of August 2007.

Crop diversification

The CAC region is known for monocropping of wheat and cotton. Traditionally, other crops are not grown, whereas crop diversification is key for increased cropping intensity, sustainability as well as increased income for the farmers. As such, under ADB project, ICARDA took a major initiative to test and demonstrate the potential of crop diversification in the region. Some of the results are as follows:

In spring wheat-based cropping systems in northern Kazakhstan, research efforts have revealed good opportunities for crop diversification. Field pea, chickpea, lentil and buckwheat are the best options for inclusion into existing rotations. Also, oat was found to be higher yielding than barley. During field days, farmers showed interest in grain legumes, but desired to have better marketing options before large-scale adoption, as well as exposure to integrated crop production technologies.

In rainfed winter wheat-based cropping systems, there are many opportunities to diversify crop production. Out of spring cereals, oat was found to be most productive and with highest water use efficiency in southeast Kazakhstan. Alfalfa is also very suitable for sustainable farming in semi-arid conditions of south Kazakhstan. Under rainfed conditions, the most successful crop appeared to be safflower, area under which has increased significantly (up to 100,000 ha). This crop is also becoming popular in both Uzbekistan and Kyrgyzstan.

In winter wheat-based irrigated cropping systems, a number of alternatives have been identified for more economical and sustainable farming. The most profitable are food legumes. Successful results were obtained in southeast Kazakhstan with soybean, in Kyrgyzstan with field pea, common bean and soybean. Safflower can also be grown under supplemental irrigation. In Kyrgyzstan and southeastern Kazakhstan, sugar beet and maize are also good alternatives for crop diversification. Nitrogen and phosphorus fertilizers at the rate of 60 kg/ha provided best returns in Kazakhstan. In southeastern Kazakhstan, most successful crop for diversification is soybean. Its area has increased recently from 3,000 ha in 2002 to more than 40,000 ha in 2006. The major reason being: locally organized market in view of establishment of soybean processing plants.

In Fergana Valley of Uzbekistan, the most widespread crops after wheat are: maize (which provides feed and forage for animals), mungbean, melons and carrots. Rice is also used for double cropping using low salinity drainage water. In Termez area, southern Uzbekistan, maize and mungbean are widely accepted by the farmers for double cropping covering around 7,000 ha and 5,000 ha, respectively. Other alternative crops used by the farmers are sesame, melons, groundnut and vegetables but rather on smaller scale.

In Tajikistan, double-cropping is widely adopted by small farmers. Maize and mungbean are widespread followed by common bean, soybean, vegetables, buckwheat, millet, tobacco, groundnut, and sesame. Rice is also grown where water availability is good.

Crop diversification studies were also initiated in the Caucasus. In Azerbaijan, encouraging results were obtained on soybean and sugar beet in irrigated areas, and chickpea under rainfed condition. In Georgia and Armenia, there is good potential for double-cropping using common bean, forages and vegetables.

3. EFFICIENT SOIL AND WATER MANAGEMENT

ICARDA Activities on Conservation Agriculture

The first phase of the ADB project “On-farm soil and water management for sustainable agricultural systems in Central Asia” was successfully completed and the second phase of the project started with effect from 1 January, 2004. The Third Steering Committee of the Project was held on 4 March, 2006 in Tashkent, Uzbekistan, during which the workplan and budget for 2006 were approved. Some of the major findings during 2006 are as following:

In rainfed spring wheat based system in northern Kazakhstan, zero tillage proved to be more profitable and energy saving during the last five years, provided nitrogen fertilizer was also applied. In some areas on heavy textured soils fall tillage was found necessary to promote better penetration of thawing snowmelt water. Direct seeding of spring wheat using modern no-tillage equipment has been lately picked up on large areas covering 10-15% of cropland. On the contrary, under rainfed winter wheat production system in southern Kazakhstan, conservation tillage did not show any noticeable effect on crop yield than the traditional practice of deep

plowing, though former was more economical. Technology of direct sowing with a combine cultivator-drill was adopted in 2006 by 20 farmers. In Kyrgyzstan, deep conservation tillage in the fall provided better soil moisture accumulation resulting in higher yield of rainfed winter wheat. This technology was adopted on about 200 ha during 2006. Under rainfed farming in Galla-Aral, Uzbekistan, direct seeding provided yield increase on summer fallow over the last three years due to better moisture accumulation. Adoption of this technology in Kyrgyzstan and Uzbekistan is being constrained by lack of equipment in the local market.

In irrigated cotton-wheat system in Tashkent and Termez provinces, Uzbekistan, broadcasting of wheat seeds under shallow cultivation compared to deep plowing was found to be economical with no significant difference in grain yield. Wheat planting into standing cotton using minimum tillage has become a generally accepted practice in almost 30%, 40% and 60% of irrigated wheat areas in Tajikistan, Turkmenistan and Uzbekistan, respectively thus enabling increased cropping intensity. A no-till equipment manufactured in India and tested in Uzbekistan has shown much better seed emergence and higher grain yields.

The newly designed equipment for planting winter wheat on cotton stubble and for seedbed preparation for soybean to raise double crop was tested during 2004-2006. Both the equipments were found to be good for conservation tillage as compared to local practice of deep plowing. The study further indicated that nitrogen fertilization rates could be reduced by 15-25%. In Turkmenistan, during last two years, continuous shallow tillage with disks at 12 cm increased soil compaction resulting in lower crop yield. Therefore, in cotton-wheat rotation, reduced tillage was found appropriate for wheat sowing after cotton, whereas generally deep tillage proved useful for planting of cotton.

Raised-bed planters, both local and those imported from Turkey, were tested in Azerbaijan, whereas in southern Kazakhstan and Uzbekistan those imported from India were tested. This practice helped in reducing the seed rate by almost half and provided higher wheat yields. At the same time, effective weed management appeared to be critical for the success of this technology. No-till planters imported from India were successfully tested in Uzbekistan for sowing wheat into standing cotton and for double cropping of mungbean and maize after the harvest of wheat.

Usage of raw ground rock phosphate as fertilizer in cotton, winter wheat and maize, instead of using industrial fertilizers which are costly and less available, was found more effective. The research outcome initiated in Tajikistan indicated that the average yields of alfalfa under 140 kg/ha of industrial phosphatic fertilizer and similar amount of rock phosphate were 20.3 t/ha and 19.9 t/ha, respectively. This revealed that rock phosphate could be used in future as a viable alternative to expensive industrial fertilizers.

Phosphogypsum (PG) application technology for remediation of high-magnesium soils was successfully out-scaled on 108 ha area in southern Kazakhstan. The results of cost benefit analysis of PG indicated that this technology gives higher crop yields and provides net benefits over the traditional practice. The use of this technology has good potential in southern Kazakhstan.

FAO-TCP for Karakalpakstan (Uzbekistan)

In 2006, ICARDA continued a FAO-TCP Project on “Sustainable agriculture practices in the drought-affected region of Karakalpakstan” started in 2004. It has been implemented mainly on five pilot farms in Chimbay district, Karakalpakstan involving a team of national scientists in collaboration with ICARDA. During the year under report, project activities included: crop

diversification by planting summer crops in spring and after harvest of winter wheat, comparative study of winter wheat varieties on salinity tolerance as well as site survey and monitoring and establishment of WUA. ICARDA organized two workshops and two formal training courses as well as traveling workshop for farmers and local scientists on conservation agriculture technologies.

Newly released winter wheat variety “Dostlik” was planted in the demonstration site. This variety showed good performance under conservation agriculture practices especially in salt- and drought-affected region of Karakalpakstan.

New implements such as three Brazilian planters, one sprayer and three Indian planters were imported and demonstrated for sowing of nine different crops. Farmers showed keen interest and learned how to use this new equipment, which proved to be useful for crop diversification. Raised bed planter helped in getting higher yield of sunflower, maize, sorghum and mungbean. The TCP is coming to an end by September 2007 when wrap up workshop will be conducted. Major conclusion of the TCP is that conservation agriculture technologies introduced for the first time in Karakalpakstan were tested by farmers and were found promising by them.

Livestock and Feed Production

An IFAD funded Project on “Community Actions in Market Oriented and Integrated Feed and Livestock Production in Central Asia” started in the fall 2006 by a Start-up workshop involving ICARDA scientists and NARS scientists from three countries: Kazakhstan, Kyrgyzstan and Tajikistan. Later, Dr. B. Rischkowsky was designated as the Project Coordinator. She visited all the three countries and discussed the workplan and activities with leading scientists and farmers involved in the project.

Training workshop on methodology of socioeconomic research was held in Shymkent, Kazakhstan. Methodology for market-driven research, value chain concept and livelihood analysis, role of gender in value-addition activities were presented and thoroughly discussed. Instructors included Drs. Aden Aw-Hassan (ICARDA), Dr. Mainville (Virginia-Tech) and L. Brent (University of Wisconsin). ICARDA-CAC office was represented by Mr. N. Nishanov, socio-economist.

Three young scientists were selected as National Professional Officers (NPOs) in livestock, feed and range management and socio-economics. Research sites were selected and field activities started in all the three countries.

CIMMYT Activities on Conservation Agriculture

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Under the World Bank “Dryland Management Project” in Central Kazakhstan the following activities were carried out in 2006: demonstration of forage crop sowing technologies, sowing forage crops under cover crops, monitoring the plots with different methods of abandoned land restoration, restoration of degraded pastureland, demonstration of perennial crops and forage mixes, agropyron sown under cover crop; and creation of demonstration plots GIS dataset

The joint Research on Conservation Agriculture for Spring Wheat, started in 2001, was continued in 2006. Researches with four alternative treatments were: (i) reduced fallow, which replaces two shallow tillage operations with herbicide applications sprayed in alternates; (ii) chemical fallow with two applications of 3 l/ha of Roundup; (iii) green manure fallow herbicide with application at 3 l/ha, sowing oats after 10-12 days of herbicide application, and rolling down oats at heading stage; and (iv) anti-erosion fallow consisting of two Roundup applications at 3 l/ha and sowing oats on 10th of July at half of normal seeding rate. There were no significant

yield differences of spring wheat between different treatments. However, the green manure fallow was least effective on yield on all landscape positions due to high crop weed populations. The influence of anti-erosion fallow treatment on crop yield was not significant. At the same time total grain yield for 5-year rotation period per unit area was higher in no-tillage technology except from south slope. In traditional technology fuel and labor expenses were 2.8 and 1.6 times higher than in no-tillage, respectively. Economic efficiency analysis on different landscape positions showed that profit margin from no-tillage technology was higher than control, on average by 11.2%. These results show that no-tillage is suitable for Northern Kazakhstan. Moreover, considering its soil protection capacity, no-tillage was found to be even necessary.

Under FAO-TCP project on Conservation Agriculture in Kazakhstan joint activities in 2006 were focused on weed control – one of the most important tasks related to CA introduction in the region. The observation trial was conducted to assess the combination of different herbicides to control broadleaf and grass weeds.

Under GEF Small Grants Program “Akbot-Kaisar farm-CIMMYT” on conservation agriculture, studies were continued in 2006 on the field left untilled for the last 2 years which was heavily infested with weeds, and therefore, was previously considered as abandoned. Chemical and mechanical fallow, direct and conventional wheat seeding, different combinations of herbicides were tested in 2006. Even in the first year directly-seeded wheat field looked clean and with uniform wheat stand.

Assessment of area under conservation agriculture in Kazakhstan was conducted by CIMMYT in 2006. Total area under no-till in Northern Kazakhstan has been estimated based on a short questionnaire survey of random farms in Akmola region and selective farm visits based on reports from regional agriculture departments of Kostanai, Northern Kazakhstan, and Akmola. Out of seven farms selected, six of confirmed to be using no-till and had some understanding of the conservation agriculture concept. The total area under no-till on these farms reaches 126,000 ha, with the largest area of 80,000 ha in Karasu farm. The farm survey questionnaire responses were collected from 51 farms. Response from 12 farms indicated that they are using no-till in the total area of 54,885 ha. However, based on responses to other questions and experience with some of the farms involved in the survey, the prudent value for an area under no-till can be not more than 20,000 ha. Thus, cumulative area under no-till in three major wheat producing areas was estimated within the range of 120,000 – 150,000 ha.

Under the FAO-TCP Project on “Enhanced Productivity of Cotton-Wheat Systems through Adoption of Conservation Agriculture Practices”, activities were conducted at 14 wheat and cotton growing farms on a total experimental area of 300 ha located in Tashkent province, Uzbekistan. Based on the results achieved, data on plant development, ecological, soil and agronomic parameters and analysis, the CA technologies with zero tillage and direct seeding systems can be considered as effective and promising for the irrigated regions of Central Asia and Kazakhstan.

IWMI Activities

There are two main and several smaller projects that IWMI is currently implementing. The main projects are “Integrated Water Resources Management (IWRM) in the Ferghana Valley (Phase III)” and “Enabling Communities in the Aral Sea Basin to Combat Land and Water Resource Degradation through the Creation of Bright Spots”. The activities are covering all the five countries of the Central Asian region. In 2006-2007, most projects were in the mid-stages of their implementation and have yielded important results.

The project on IWRM Ferghana-Phase III is funded by the Swiss Agency for Cooperation and Development (SDC) and is implemented in collaboration with the Scientific Information Center of the Interstate Coordination Water Commission of Central Asia. The current phase started in 2005. In 2006, a clear IWRM structure integrating both vertical (linkages between different hierarchy levels – canal, WUA or other non-agricultural primary water users, water user groups and farmers) and horizontal (incorporation of inter-sectoral linkages such as industrial, water supply, energy, environment etc.) interests and separating governance and management functions were developed. A pioneering step towards Irrigation Management Transfer (IMT) has been made in Kyrgyzstan. The state (Water Ministry and the Osh Basin Water Management Organization) and water users (Union of Canal Water Users established by the project initiative) signed an agreement that transferred the governance functions over the Aravan Akbura pilot canal to a joint state-public affiliation body. In addition, 22 WUAs are being established along pilot canals, which occupy more than 30,000 ha of land and strengthened through establishing effective water user groups (45 WUGs in Kyrgyzstan, 3 WUGs in Uzbekistan and 28 WUGs in Tajikistan). This latter method improved water allocation and distribution, led to a greater user-participation, activated the WUA councils, decreased the number of conflicts among farmers, and improved the ISF collection. Capacity building activities on various aspects of IWRM were done extensively through seminars and training programs. Dissemination was carried out through PR campaigns using local mass media (TV shows, radio, newspapers) based on IWRM's key dissemination strategies in consultation with stakeholders, focus groups and local communities. Also publications such as guidelines, brochures (business planning, water distribution, water allocation, water accounting, water conservation, etc.), posters, and policy briefs in local languages were widely distributed. These activities have facilitated the scaling out and propagation of IWRM principles to a broader area and audience and created increased public awareness about them. The links have been established with local technical and academic institutions (colleges and universities) to facilitate the adoption of IWRM principles into local curricula for rearing future generations of water managers. Memorandum of Understanding with Marhamat Hydromelioration College in the Andijan Province of Uzbekistan, Osh Agricultural Institute in Kyrgyzstan, and Tajik Technical Institute (Sogd Branch) was signed for cooperation. Partnership links have been established with local extension services such as Rural Advisory Service in Osh, Nau in Khodjent and Agricultural Research Polygons of the Ministry for Agriculture and Water in the Ferghana and Andijan Provinces to train national consultants in order to disseminate project technologies on best water management practices, conservation and improved productivity to a larger number of farmers, organizations and agencies.

The project on “Enabling Communities in the Aral Sea Basin to Combat Land and Water Resource Degradation through the Creation of Bright Spots” is funded by ADB and implemented jointly by IWMI/ICARDA/ICBA in collaboration with NARES of Kazakhstan, Turkmenistan and Uzbekistan. The project started in March 2005. The project has three main components on: (1) Identification, promotion and adoption of innovative practices that prevent further land and water degradation in the Aral Sea Basin; (2) Plant production on salt affected soils; and (3) Capacity building and dissemination. In 2006, Component 1 activities were focused on (1) the development of a policy brief based on the outcomes of the work undertaken on licorice at the Galaba site in Uzbekistan; (2) the articulation of the methodology used for the identification of a Bright Spot; and (3) generation of Bright Spot information on wheat/cotton systems in Turkmenistan and drafting of a research report were undertaken. Component 3 is implemented as a Knowledge Sharing pilot project by IWMI.

Knowledge Sharing (KS) Pilot project under Bright Spots Project is directed at strengthening the capacity of project partners, both farmers and the NARES groups, in the management and remediation of saline affected land and water; and dissemination of the project results through

creation of a land management network, which will include state agency and international project representatives in all the 3 project countries.

The creation of learning alliances is the most important activity of the KS initiative. Two farmer's alliances were established for dissemination of two successful technologies, namely licorice and phosphogypsum, on rehabilitation of degraded soils. More than 100 ha of land have been dedicated to these technologies involving local farmers through learning alliances. Within these learning alliances the development of detailed business plans for the adoption and out-scaling of these technologies are being prepared in collaboration with farmers, the private and public sectors. Several potential formal alliances were identified in the project locations. For example, farmers' associations in Uzbekistan, agricultural cooperatives in Kazakhstan and *dehkan birleshik* (farmer unions) in Turkmenistan can be listed as potential learning alliances, with sustained links.

A project on "Water Productivity Mapping" is currently being conducted in Central Asia by IWMI in order to produce a consistent set of water productivity maps (WPM), methods, and models at river basin level as a part of its global initiative, with specific focus on irrigated command areas, using satellite sensor data, secondary data, and field-plot data. The main objectives of the current stage are to understand, develop, and map indicators of water productivity (WP) using satellite sensor data at various scales or pixel resolutions. Activities undertaken in 2006 were focused on: (1) identifying test fields within the test sites – Galaba (Galaba farm in Bayaut district of Syrdarya province in Uzbekistan) and Kuva (Cotton Growing Institute in Kuva district of Ferghana province); and (2) Installation of measurements equipments and collection of data. In particular, at each test field the v-notches for surface water inflow/outflow measurements and the piezometers for groundwater table measurements were installed. Regular measurements of the amount of irrigation water applied to each test field, together with the measurements of groundwater depth and soil moisture before each irrigation were taken. At 3 points inside each test field the biophysical plant parameters (wet and dry weight, density and height), PAR/LAI measurements by LP-80 AccuPAR Ceptometer, NDVI measurements by NDVI Camera, hyperspectral measurements by ASD spectroradiometer were collected regularly as well as the crop yield data at the harvesting. The meteorological data were collected hourly (solar radiation, air temperature and humidity, precipitation) from the WathchDog meteostation, installed at Galaba site and twice a day the reference evapotranspiration by ET gauge, installed at Kuva site; daily data (air temperature and humidity, precipitation) from Fedchenko agro-meteostation at Kuva site. The set of seasonal IRS-P6 and one QuickBird satellite images for each test site were purchased and georeferenced.

This project on "Understanding Rural Livelihoods and Water Management in the Ferghana Valley" is intended to build on and support the on-going work of the "Integrated Water Resource Management in Ferghana Valley (IWRM-Ferghana)" Project. The overall objective of the project is to contribute to effective support for water reforms, to improve equity of water distribution and to increase water productivity through better understanding of livelihoods systems and constraints in rural communities of the Ferghana Valley, differing due to different access to land and water resources.

The project research fieldwork methodology is drawn heavily on participatory rural appraisal (PRA) method, mainly conducting focus group discussions (FGDs) among village residents through applying PRA tool on Resource mapping, Venn-diagram and Income generation activities to get qualitative data on livelihoods of farmers and other rural residents, the relationship between these livelihoods and water resources and how livelihoods strategies being employed interact with water resources and water management.

The main activities of the project were focused on: (1) identifying 16 study sites/villages along the Big Ferghana Canal (BFC) in Uzbekistan and Tajikistan and 6 villages along the Right Bank Canal in Kyrgyzstan and conducting FGDs with the purpose to obtain qualitative data in them; (2) Building partnership with local NARES, especially with “Ecology and Water Resources Management” faculty from Tashkent Institute of Irrigation and Melioration (TIIM), Uzbekistan and “Agro technology” faculty of Khodjent region branch of Tajik Technical University; (3) Building capacity of partners on conducting Participatory Rural Appraisal (Focus Group discussions); and (4) Analyzing data collected.

Socio-Economic Studies by ICARDA

The socio-economic research activities by ICARDA were focused on rural livelihood analyses and economic assessment of technologies found promising under the two ADB Projects on Soil and Water Management, and Bright Spots. Livelihood analyses were conducted through structured farm-level surveys around project sites involving about 100 farming households per site in Kazakhstan (2 sites), Kyrgyzstan (2 sites) and Uzbekistan (1 site) under the Soil and Water Management Project, and under the joint IWMI-ICARDA-ICBA Bright Spots Project in Uzbekistan and Turkmenistan on the impact of salinity on rural livelihoods involving 150 households from each country under high, medium and low salinity conditions (50 households from each soil salinity zone).

The survey results revealed that crop production systems in these countries are being re-established by merging small-scale farms into larger cooperative aggregates in order to ensure effective use of natural, financial and intellectual resources. Findings on land management and irrigation water practices indicated that farmers at the surveyed sites used traditional methods of soil cultivation and irrigation. Analysis concerning property issues and land tenure revealed that the majority of on-farm activities were constrained because of inappropriate policies related to the activities of Water Users Association, irrigation water distribution and measuring, water pricing and farm taxation issues. Non-availability of inputs in time and lack of credit appeared to be other important constraints.

4. STRENGTHENING OF NARS

All the centers involved in the CGIAR Program in CAC laid considerable emphasis on capacity building. It includes various trainings, study tours, participation in international, regional and national scientific meetings and workshops, supply of computers and other research equipment, etc. During the year under report, the CAC Program has arranged about 50 short- and long-term training courses, study visits, traveling workshops and other training activities with participation of more than 674 scientists. In addition, regional and international conferences and field days were organized with participation of more than 1,500 persons. Several of these activities are given below, whereas details for some other human resource development initiatives are provided in Annex II.

Conferences/ Workshops/Field Days

The Ninth Meeting of the Steering Committee of the CGIAR Eco-Regional Program for Sustainable Agriculture in Central Asia and the Caucasus (CAC) was held in Tashkent, Uzbekistan from 3-5 April 2005. More than 50 scientists from the CAC countries as well as from the seven CG centers and three IARCs as members of the Consortium attended the meeting.

The Ninth ICARDA-CAC Regional Program Planning Meeting was held on 6 April 2006 in Tashkent, Uzbekistan. During this important meeting, the results of various joint research

activities with partners from the region of Central Asia and the Caucasus carried out during the year 2005-2006 were discussed as well as the research program for the next year was finalized.

The Board of Trustees of IWMI gathered for its 41st meeting in Tashkent, Uzbekistan, during 22-24 March 2007. The meeting was attended by high-level officials from the Government of Uzbekistan and representatives of the CGIAR Program for CAC. During the meeting, IWMI Board of Trustees were informed about the activities of the IWMI Office for Central Asia. They have also reviewed the progress of ongoing programs and explored new opportunities to further expand activities in Central Asia.

The 2nd Central Asian Cereals Conference was conducted on June 13-16, 2006 in Cholpon-Ata, Kyrgyzstan. More than 210 scientists and agriculture specialists from 17 countries including Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Russia, Denmark, Sweden, Turkey, Belgium, Australia, USA, Brazil, Mexico, Syria, Nepal, UAE, and Zimbabwe participated at the conference. The next 3rd Central Asian Cereals Conference will take place in Dushanbe, Tajikistan in 2009.

An Expert Consultation Meeting on Regional Research Needs Assessment was organized from 7-9 March 2007 by CACAARI, GFAR, and ICARDA in Tashkent, Uzbekistan. The meeting was attended by 68 distinguished scientists, heads of NARS and policy makers from the CAC and representatives of international organizations and other regional fora (FAO, APAARI, AARINENA) and research centers (ICARDA, CIMMYT, IWMI, IFPRI, Bioversity International, etc)

An International Ecoforum on “Reorienting Agricultural Research to Achieve the Millennium Development Goals: International and Regional Experience” was organized jointly by the International Fund “ECOSAN” and the Ministry of Agriculture and Water Resources (MAWR), Uzbekistan on 17 January 2007 in Tashkent, Uzbekistan. It was also co-sponsored by the CACAARI and ICARDA.

A Meeting to review the research findings of the ADB Project on Soil and Water Management and Discussion on Linkages to Central Asian Countries Initiative on Land Management (CACILM) was held in Tashkent on 6 March with the participation of the DG of ICARDA, Dr. Mahmoud Solh. Dr. M. Suleimenov, Consultant, ICARDA-CAC and project national coordinators presented the project research findings. Dr. T. Oweis, Director, Water and Land Management Program of ICARDA, made a presentation on “The Importance of Soil and Water Resources in Central Asia”. Dr. Raj Paroda made a presentation on linkages of the ADB project achievements to CACILM.

The Fifth Coordination Committee meeting of the Central Asian and Transcaucasian Network on Plant Genetic Resources (CATCN-PGR) was held on 18-20 January 2007 in Tashkent. Along with National PGR Coordinators from Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, representatives of Bioversity International (Dr. George Ayad and Ms. Muhabbat Turdieva), CGIAR-PFU (Drs. Raj Paroda and Zakir Khalikulov), ICARDA (Dr. Kenneth Street) and GCDT (Ms. Brigitte Laliberte) participated in the meeting. Dr. Sergey Alexanian from VIR, Saint Petersburg, Russia also attended the meeting as an observer. Eminent scientists on plant genetic resources from Central Asia and the Caucasus participated in the meeting as resource persons.

An international seminar on “Assessment of plant breeding capacity and related biotechnology research in Kazakhstan and Central Asia” was organized on 10-11 April 2006 in Almaty, Kazakhstan. Twenty five scientists from Central Asian countries attended the meeting.

An international meeting on “Enhancement of nutrition in Central Asia through biofortification of wheat and potato” was organized in the framework of the Harvest Plus International Program on 13 April 2006 in Almaty, Kazakhstan. Forty scientists, food and agriculture specialists participated in the meeting.

The General Assembly Meeting of CACAARI was held in Tashkent on 5 April 2006. The meeting involved nine participants, including Heads of NARS from Azerbaijan, Armenia, Georgia, Kyrgyzstan, Tajikistan and Uzbekistan. Dr. Raj Paroda, Head, PFU-CGIAR and Regional Coordinator, ICARDA-CAC also participated as a special invitee. After detailed deliberations, Dr. Samvel Avetisyan from Armenia was unanimously elected as Chairman of CACAARI, whereas Prof. Abdushukur Khanazarov from Uzbekistan was elected as Executive Secretary.

A meeting of the Regional Rice network was held in Tashkent on April 5 2006. The meeting was facilitated by Dr. Raj Paroda, Head, CGIAR-PFU and Dr. Zakir Khalikulov, Consultant Scientist, CGIAR-PFU being a follow up on the discussions held during the 5th International Rice Genetics Symposium, organized in Manila in 2005. The meeting was organized to discuss with local officials their interest in establishing a regional network of rice producing countries in the region. All countries agreed to establish and support a Regional Rice Network. It was decided that Uzbek Rice Research Institute, Tashkent would coordinate the network activities with the help of PFU.

International Workshop on “Improving conservation tillage machinery for irrigated agriculture” was organized by ICARDA-CAC on 19 April 2006 at the Uzbek Institute of Mechanization and Electrification of Agriculture, Yangiyul, Tashkent Province, Uzbekistan. Agronomists and mechanical engineers from Kazakhstan and Uzbekistan, working on the design and assessment of conservation tillage equipment for irrigated agriculture, attended the workshop. Those participated were: Drs. M. Suleimenov, G. Singh, A. Nurbekov and O. Tsay (ICARDA-CAC), Drs. R. Gupta and K. Sayre (CIMMYT), Dr. F. Friedrich (FAO) and Drs. J.M. Reichert and R. Casao Junior, Conservation Agriculture specialists from Brazil beside national scientists. A total of 30 participants attended the workshop.

The Third Regional Conference on Yellow Rust was held on 8-11 June 2006 in Tashkent. More than 62 scientists from 18 countries (Azerbaijan, Afghanistan, Australia, Belgium, Denmark, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Tunisia, Turkey, Syria, Iran, Pakistan, Ethiopia, Kenya, USA and Mexico) participated in the conference. Distinguished international speakers presented the results of their research on yellow rust, covering advanced methods of YR management, with special emphasis on application of biotechnology tools. Many young scientists from the region presented their work, which was highly appreciated.

Conference on “Modernization of agriculture through introduction of new technologies in cotton and grain production: problems and their solution” was organized jointly by the Committee of Agriculture, Water Industry and Ecology of Senate of the Republic of Uzbekistan and the Regional Office of ICARDA in CAC on 30 June 2006 in Tashkent. The conference gathered more than 40 participants. The participants shared their vision of constraints existing in the agricultural sector of Uzbekistan and proposed specific solutions to address them.

A two-day workshop for elaborating the strategy and workplans to develop a Regional Agricultural Information System in CAC (CAC-RAIS) was organized by the Central Asia and the Caucasus Association of Agricultural Research Institutions (CACAARI) in partnership with the GFAR and ICARDA on 15-16 January 2007 in Tashkent, Uzbekistan.

On 2-4 August 2006 Annual meeting of Kazakhstan-Siberia Network for wheat improvement (KASIB) was held in Northern Kazakhstan (Schuchinsk). The meeting was attended by more than 30 breeders, phytopathologists from Kazakhstan and Russia; they summarised the outcomes of the work done throughout existence of KASIB (2000-2006), presented information on the KASIB research activities. Directions for improving KASIB and Kazakhstan-Mexico shuttle breeding activities were identified and approved.

Farmers' Fair on technologies of saline soils, organized jointly by ICARDA, IWMI and Gulistan State University on 28 August 2006 in Gulistan was the first such activity ever held in the country. Along with the organizers, more than 20 national and international organizations such as ICBA, ZEF UNESCO Khorezm Project, CIP, AVRDC, national research institutions and others actively participated in this Farmers' fair with their exhibits and handout materials on different aspects of saline land management. The Farmers' Fair was attended by about 400 farmers from all districts of Syrdarya Province and high officials from the Uzbek Government.

Regional planning workshop of IFAD-funded project "Community Action in Integrated and Market Oriented Feed-Livestock Production in Central Asia and South Asia" was organized by PFU-CAC in Tashkent, Uzbekistan on 5-6 September 2006. The event gathered 19 participants from ICARDA, NARS of Kazakhstan, Kyrgyzstan, and Tajikistan, NGO representative from Tajikistan and faculty members of Kazakh, Kyrgyz, and US universities. The workshop was the first event aimed at developing project work plans.

A Training Course on "Advances in Biosaline Agriculture with Reference to Central Asia and Caucasus" was held in Tashkent, Uzbekistan from 15-21 May 2006. This training benefiting 44 scientists, younger researchers and technicians from Armenia, Azerbaijan, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan was organized by ICBA in close collaboration with ICARDA-IWMI and sponsored by the OPEC Fund for International Development (Vienna, Austria) and Asian Development Bank (Manila, Philippines).

The Steering Committee Meeting of Vegetable Research and Development Network in CAC was organized by the regional office of the World Vegetable Center (AVRDC) and PFU on 9 August 2006 in Tashkent, Uzbekistan. National Coordinators of vegetable network from all the eight CAC countries participated in the event. All the country representatives have made presentations on current progress of vegetable production development in their countries. Based on the recommendations of the Meeting held on April, 2005, the National Coordinators of Azerbaijan, Armenia, Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan signed the Agreement on Working Program for the Central Asia and Caucasus Regional Network for Vegetable Systems Research and Development (CACVEG).

A field day under the FAO-TCP Project on "Sustainable agriculture practices in the drought affected region of Karakalpakstan" was organized jointly by ICARDA-CAC, Ministry of Agriculture of Karakalpakstan and SANIIRI on 11 August 2006 in Chimbay (Karakalpakstan). In all, 42 participants, including farmers, representatives of Farmers' Association, WUA and scientists participated in this event. All the participants expressed their interest in wider adoption of bed planting technology in Karakalpakstan.

A farmers' field day was organized by ICARDA-CAC under FAO TCP project on "Sustainable agricultural practices in the drought affected region of Karakalpakstan" on 12 October 2006, in Chimbay district. The major goal of the event was to facilitate demonstration, experience sharing and discussion of zero till and bed planting practices, soil fertility improvement as well as the new machines for conservation agriculture. The field day was attended by 55 participants

including local government officials, representatives of international organizations, scientists and farmers.

Review and Planning Meeting on “Vegetable Variety Selection in Central Asia and the Caucasus”, organized jointly by AVRDC and PFU-CGIAR for CAC, was held on 7-9 August 2006 in Tashkent, Uzbekistan. Twenty NARES specialists from Central Asia and the Caucasus, namely Armenia (2), Azerbaijan (3), Georgia (2), Kazakhstan (3), Kyrgyzstan (2), Tajikistan (2), Turkmenistan (2), and Uzbekistan (4) attended the workshop. The total of 28 participants from NARES and international organization attended the workshop. The workshop participants discussed current constraints and perspectives of regional varietal trial conducted this year in different ecologic climatic conditions of CAC region in six locations in Azerbaijan, Kazakhstan, Turkmenistan and Uzbekistan. The participants visited varietal trial and vegetable production site.

Three scientists from CAC region (Ms. Karine Sarikyan, Armenia; Mr. Serik Jantasov, Kazakhstan and Ms. Makhfurat Amanova, Uzbekistan) participated in the workshop on “Evaluation of Superior Vegetable Varieties” organized at AVRDC – the World Vegetable Center HQ, Taiwan on 15-27 May 2006. Individual training was conducted on the same Program topics for Mr. Bakhtiyor Odinaev, Tajikistan during the period of 11-17 May 2006 at the AVRDC Regional office for CAC.

First Regional Training Workshop on “Evaluation of Superior Vegetable Varieties for Central Asia and the Caucasus”, organized jointly by AVRDC and PFU-CGIAR for CAC, was held on July 31 – August 4 2006 in Tashkent, Uzbekistan. Ten participants from NARES in 8 countries, namely, Armenia (1), Azerbaijan (1), Georgia (2), Kazakhstan (1), Kyrgyzstan (2), Tajikistan (1), Turkmenistan (1) and Uzbekistan (1) attended the workshop. The AVRDC’s Training Program on 15 various topics was used as the basis for the training by adopting it to CAC region.

Representatives of five Central Asian countries and several international organizations and donors met in Almaty, Kazakhstan, on 16 November to launch the Central Asian Countries Initiative for Land Management (CACILM) in which ICARDA has been given responsibility to lead the Sustainable Land Management (SLM) research sub-component. Dr. W. Erskine, ADG (R) presented the ICARDA's vision on the SLM research under CACILM. Dr. M. Suleimenov and Ms. I. Kononenko also attended this important meeting.

The Third Regional Yellow Rust Conference held 8-11 of June 2006 in Tashkent, Uzbekistan. In the conference were attended about 62 scientists from 18 countries from the world Azerbaijan, Afghanistan, Australia, Belgium, Denmark, Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Tunisia, Turkey, Syria, Iran, Pakistan, Ethiopia, Kenya, USA and Mexico.

The Second Central Asia cereals conference held in Kyrgyzstan 13-16 June 2006, more than 200 scientists participated in the conference. 20 scientists from Uzbekistan was supported by ICARDA-CAC.

English Training

A three-month intensive English training was organized from 11 December, 2006 - 11 March, 2007 in Tashkent under the aegis of the CGIAR Collaborative Research Program for Sustainable Agricultural Development in CAC. The course was attended by 20 young scientists from Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan. Since the beginning of this program, a total of 443 young scientists have been trained in English language.

Information Dissemination

During the year under report a large number of publications, scientific papers, several dozens of booklets, brochures, leaflets, policy briefs, etc were produced and disseminated among farmers and NARS partners by PFU and all Consortium partners both in English and Russian. Some of them are:

The CAC News was published quarterly in English and Russian for circulation among all the Consortium partners and other stakeholders. It covers various activities of the CGIAR Program in the region.

Two issues of “Agromeridian” journal №1-2006 and №2-2006 were published in 2006 by CIMMYT-Kazakhstan. The journal, distributed mainly among Central Asia and the Caucasus countries, and Russia, is an important source of valuable information for the plant breeders, geneticists, seed producers, agronomists, and other specialists in CAC to improve wheat varieties, grain quality and crop yield in this region.

R. Paroda. Addressing the Challenges for Sustainable Agriculture in Central Asia. CGIAR Program Facilitation Unit (PFU) and ICARDA Regional Program for CAC, Tashkent, Uzbekistan, February 2007 (both in English and Russian)

M. Suleimenov. Sow Don't Fallow (In Russian, it can be read both ways: sow, don't fallow or don't sow, do fallow). A collection of articles. Interligal Publishers, Almaty, Kazakhstan. 220 pp. (in Russian).

P.N. Mathur, R. Paroda, M. Musayeva. Agricultural Extension Methodology for Transfer of Technology. Training Manual. ICARDA Regional Program for CAC, Tashkent, Uzbekistan.

F. Vyshpolsky, M. Qadir, A. Karimov, K. Mukhamedjanov, U. Bekbaev, R. Paroda, A. Aw-Hassan and F. Karajeh (2007). Productivity Enhancement of High-magnesium Soils and Waters in Central Asia through the Application of Phosphogypsum. – submitted

Mekhlis Suleimenov, Mustafa Pala, Raj Paroda, Kanat Akshalov, Firuza Khasanova, Ludmila Martyniva, Rakhim Medeubaev; “New Technologies for Central Asia” ICARDA CARAVAN, #23, December, 2006.

Proceedings of International Workshop “Increasing Market-oriented vegetable production in Central Asia and the Caucasus through collaborative research and development”, organized earlier meeting in Tashkent from 24-27 April 2005. The proceedings have been edited by Kuo C.G., R.F. Mavlyanova, and T.J. Kalb.

Abstracts of the 2nd Central Asian Cereals Conference held in 13-16 June 2006, Issyk-Kul, Kyrgyzstan, 550 pp.

R. Trethowan, A. Morgounov, Yu. Zelenskiy, J. Lage. Shuttle breeding between Mexico and Kazakhstan: results, refinements and prospects. *Agromeridian*, 2(3), Almaty, 2006, p. 23-27.

A. Morgounov, H. Gomez-Becerra, A. Abugalieva. Iron and Zink Concentration in Grain of Spring Bread Wheat from Kazakhstan and Siberia. *Agromeridian*, 1(2), 2006, p. 5-16.

P. Ranum, R. Mustafarov, R. J. Pena, A. Abugalieva, A. Morgounov. Wheat, Flour and Bread in Central Asia. *Cereal Foods World*, (4), 2006, p. 166-171.

A. Morgounov, H. Gómez-Becerra, A. Abugalieva, M. Djunosova, M. Yessimbekova, H. Muminjanov, Yu. Zelenskiy, L. Ozturk, I. Cakmak. Iron and zinc grain density in common wheat grown in Central Asia. *Euphytica*, accepted.

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Bekchanov B. B., Rabimov A. R., Toderich K.N. 2006. "The technology of preparation of Tamarix cuttings and its utilization to increase productivity of salt affected lands", Tashkent, 4 p. (in Russian).

Alimov J. A., Toderich K. N., Alimova G. D., Nurmedov D. 2006. Multiplication of perennial non-conventional crop seeds, and technology of transplanting 4p. (in Uzbek).

Rabbimov A. R., Bekchanov B., Yusupov S. Y., Toderich K. N., Mukimov T. H., Khamraeva G., 2006. Technologies of fodder production on saline lands of Uzbekistan. Samarkand, 24 p. (published in Uzbek).

Toderich K.N., Li V.V., Clanton C. Black, Yunusov T., Suisakaya E.V., Mardanova G.K. & Gismatullina L.G. 2006. Linkage studies of structure, isoenzymatic diversity and some biotechnological procedures for *Salsola* species under desert saline environments. *Biosaline Agriculture and salinity Tolerance in plants* (Munir Ozturk, Y. Waisel & A. Khan eds), Birkhauser Publisher: 73-83

Kristina Toderich, Clanton C. Black, Ekaterina Juylova, Osamu Kozan & Tolib Mukimov, 2007. "C3/C4 Plants In The Vegetation Of Central Asia, Geographical Distribution And Environmental Adaptation In Relation To Climate". In the book: Rattan Lal (ed.) "Sustainable management of natural resources", Ohio State University, USA: 123-151.

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Kristina N. Toderich, Nicholas P. Yensen, Yukio Katayama, Yoshiko Kawabata, Victor A. Grutsinov, Gulnora K. Mardonova & Lilya G. Gismatullina., 2006. "Phytoremediation Technologies: using plants to clean up the metal/salts contaminated desert environments". *Journal Arid Land Studies*. Vol. 15-4: 455-459

Website

The web site of the CGIAR Collaborative Program for CAC is available for consortium partners on the Internet since September, 2001. It contains relevant information on CG Centers and NARS partners involved in the Program as well as all major achievements made so far, both in English and Russian. The site can be accessed at: www.icarda.org/cac. It is also linked to the CGIAR website: www.cgiar.org. A major effort on updating and re-designing the website to further increase its user-friendliness and information content has been initiated.

5. MISCELLANEOUS ACTIVITIES

Initiatives on Resource Generation

A special meeting on the CGIAR Program for Central Asia and the Caucasus (CAC) was held during CGIAR AGM 2006 in the afternoon of 4 December. The meeting, co-sponsored by the World Bank, IFAD, USAID and ICARDA, was attended by representatives of various donor organizations, CG Centers as Consortium partners, and CGIAR Science Council. All participants highly commended the achievements of this project and assured their support to the CAC program.

On 22 November 2006 Asian Bank for Development (ADB) notified its approval of ICARDA's proposal to extend the Soil and Water Management Project (RETA 6136) on a no-cost basis for another seven months, until 31 July, 2007.

The International Fund for Agricultural Research (IFAD) has recently approved a project on "Community actions in market oriented and integrated feed and livestock production in Central and South Asia". The three-year project will cover Kazakhstan, Kyrgyzstan, Tajikistan and Pakistan.

CACILM Multicountry Partnership Framework Support Project has been endorsed by GEF and approved by the ADB for funding under the first phase of the CACILM. ICARDA is the lead center for the Sustainable Land Management Research Component under this project. Inception activities are to launch by early June, 2007.

Five-year project on "In situ/on farm Conservation of Agrobiodiversity (Horticulture Crops and Wild Fruit Species) in Central Asia" started in 2006 by Bioversity International in Central Asia with support of UNEP-GEF. Five countries in the region, namely Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan are involved in the project implementation. This project aims to conserve the high diversity of horticulture crops and wild fruit species found in the Central Asian countries, a resource base of global significance.

Project Proposal on Sustainable livestock and rangeland biodiversity management to combat natural resource degradation and improve rural community livelihoods in Kazakhstan, Turkmenistan and Uzbekistan has been finalized and submitted for funding. The project was endorsed by the governments and UNCCD focal points in these countries. Immediate objective of this project is to identify processes leading to ecosystem degradation, assess the potential use of biodiversity for new production and market environments, and develop options for improved market-oriented, income generating sustainable rangeland and livestock production management involving local communities.

Project on Crop Diversification with Food Legumes for Improving Income and Nutrition of the Rural Poor, and Sustainable Productivity of Cereal-based Cropping Systems in South and Central Asia has been jointly developed and submitted for IFAD funding by ICRISAT, ICARDA, AVRDC and APAARI.

Project proposal on Sustainability of Wheat and Rice on Saline Lands of the Aral Sea Basin has been jointly developed by IWMI, ICARDA and IRRI. This Project addresses the adverse effects of salinity-induced soil degradation in the Aral Sea Basin, by identifying the appropriate options and conditions income of the resource-poor farmers through effective management of salt-prone land and water resources in the rice-wheat production systems of lower Aral Sea Basin. A comprehensive assessment of existing cropping systems, appropriate water saving technologies,

soil and agronomic management strategies and key policy requirements would be developed, along with improvement of national agricultural research capacities and extension services. IRRI, being the lead Center, is approaching possible donors for its funding.

Project Proposal on Conservation Agriculture for Sustainable Land Management in Central Asia has been developed with the main objective to improve irrigated and rainfed farming systems by integrating conservation agriculture into land management practices, with the overall goal of achieving improved soil fertility, food security and improvement of rural livelihoods in CAC region.

A Project Proposal on “Integrating KS Approaches and Tools in the Regional Agricultural Information System in Central Asia and the Caucasus (CAC-RAIS)” was submitted by PFU-CGIAR and ICARDA for funding to CGIAR under the ICT-KM Program.

FAO project “Establishment of a national information sharing mechanism on the implementation of the Global Plan of Action on plant genetic resources for food and agriculture in Azerbaijan” was initiated in 2006. The project aims to improve the ability of Azerbaijan to make decisions about plant genetic resources including establishing objectives, defining needs and allocating resources; build stronger partnerships among stakeholders in plant genetic resources management within Azerbaijan; increase the ability of the country to monitor changes in its plant genetic resources over time; improve the quality of information about plant genetic resources status and dynamics; improve the access to and sharing of information about plant genetic resources on national, regional and global levels; and to enhance the capacity of Azerbaijan to meet international reporting obligations (GPA, Second Report on the State of the World’s PGRFA, CBD, etc). Similar project is started in 2007 in Georgia.

FAO-TCP Project “Strengthening the Plant Biotechnology Capacity for Characterization and Utilization of Plant Genetic Resources in Kazakhstan” was developed by CIMMYT-Kazakhstan. Total sum of the project – \$380,000 for two years. The draft of the Project is in the process of correction and adjustment to FAO requirements for TCP projects.

CIMMYT-Kazakhstan prepared and submitted to the World Bank a proposal on wheat breeding with total sum of \$50,000 for two years. The proposal passed the 1st stage of competition and presently is in the process of the final selection for funding.

CIMMYT-Kazakhstan prepared and submitted proposal on agriculture knowledge dissemination for farmers through CIMMYT established journal “Agromeridian” with the total sum of \$30,000 for two years. The proposal passed the 1st stage of competition and presently is in the process of the final selection for funding.

A Project Proposal on “Sorghum and Pearl Millet for Improving Crop-livestock Productivity and Farmers’ Livelihood in Central Asia” is being jointly developed by ICRISAT, ICARDA, ICBA and NARS. Project partners conducted a preliminary evaluation of a limited number of improved populations of sorghum and pearl millet developed at ICRISAT. Initial results were encouraging.

Inter-Center and NARS Partnerships Strengthened

The Inter-Center Partnership has been further strengthened by having new initiatives, such as varietal improvement of wheat (CIMMYT and ICARDA), crop diversification (ICARDA, ICRISAT, IRRI CIP and AVRDC), IPM (ICARDA, MSU and CIMMYT), soil and water management (ICARDA and IWMI), feed and livestock development (ICARDA and ILRI), plant genetic resources (IPGRI, ICARDA, CIMMYT, AVRDC and ICBA), and human resource

development involving all centers, the details of which have been included in this report. PFU is also trying to facilitate the activities of other centers of the Consortium, who do not have their staff located in the region. Specific details of centerwise activities have already been provided in this report.

Dr. Mahmoud Solh, DG of ICARDA, during his brief visit to Tashkent from 5-8 March, delivered a lecture and opened the ICARDA Room at the Tashkent Agricultural University (TAU), participated in the Review Meeting of the Project on Soil and Water Management, met with the Minister of Foreign Affairs of Uzbekistan, participated in the Regional Research Need Assessment Meeting, and had a meeting with all NARS leaders regarding future cooperation. In the TAU, Honorary Certificates were presented to Drs. Mahmoud Solh and Raj Paroda for “strengthening the scientific links of the NARS with IARCs”.

Memorandum of Understanding was signed between ICARDA and Gulistan State University (GSU) by Dr. Mahmoud Solh, DG of ICARDA, and Dr. Ulugbek Tashkenbaev, Rector – GSU, on 7 March 2007 in Tashkent. The Memorandum envisages strengthening of cooperation between ICARDA and GSU on several areas of mutual benefit, such as exchange of information, research cooperation and capacity building.

Memorandum of Understanding between IWMI and the Gulistan State University was signed by Dr Peter McCornick, IWMI Regional Office for Asia, and Dr Ulugbek Tashkenbaev, Rector, GSU. This MoU is expected to strengthen scientific and practical collaboration between the institutions.

A Memorandum of Understanding with Gulistan State University (GSU, Uzbekistan) was signed on 20 June 2006 by Dr Mohammed Al-Attar, Director General of ICBA, UAE and Prof. Ulugbek Tashkenbaev, Rector of the GSU.

Awards and Recognitions

During the Second International Agroforum in Armenia held on 22-23 September 2006 in Yerevan, H.E. Mr. David Lokyan, Minister of Agriculture of Armenia, awarded Dr. Raj Paroda, Regional Coordinator, ICARDA-CAC and Head, PFU-CGIAR with a Gold Medal as a token of appreciation for his outstanding contribution towards the development of sustainable agriculture in Armenia.

Important Visitors

- Dr. Robert Zeigler, IRRI Director General, visited Uzbekistan on 8 February. He attended a meeting with representatives of the Regional Rice Network in Central Asia, in Tashkent, Uzbekistan. IRRI’s goals in the region were set to 1) facilitate close collaborative research among scientists in these temperate rice countries to help maintain food security, 2) share information on rice towards increasing production of japonica rice, and 3) provide a framework for IRRI-NARES partnership to facilitate and strengthen research on temperate rice and technology delivery.
- An EPMR Team (Dr. Elias Fereres and Dr. John Passioura) visited Tashkent, Uzbekistan from 7-9 June 2006 to have an overview of the progress achieved under the ICARDA Regional Program for Central Asia and the Caucasus. During this visit, they met with Dr. Amir Amanov, Advisor, Office of the President of the Republic of Uzbekistan and Dr. Abdushukur Khanazarov, Deputy Minister of Agriculture and Director General, Uzbek Scientific Production Center for Agriculture. They also met with ICARDA Regional Office research staff. During this meeting, Dr. Raj Paroda made a brief presentation on research

highlights in CAC with special emphasis on inter –center collaboration. Also the EPMR team visited the experimental fields of the Uzbek Cotton Growing Research Institute (UzCGRI), Uzbek Research Institute of Plant Industry (UzRIPI), Central Asian Research Institute of Irrigation (SANIRI), where collaborative activities are being undertaken jointly by Uzbek NARS and ICARDA scientists.

- Dr. Bob Everitt, Coordinator of CACILM Program at ADB, Manila, and Dr. John Patterson, Head of CACILM Secretariat in Bishkek, Kyrgyzstan, visited the Regional Office of ICARDA-CAC. Dr. Raj Paroda made a brief presentation on possibilities of linking various technologies under the Sustainable Land Management (SLM) research component of the CACILM Multi-Country Partnership Framework (CMF) Support Project to be funded by CACILM.
 - Dr. K.N. Rai, Pearl Millet Breeder, ICRISAT, visited Uzbekistan, Turkmenistan and Kazakhstan from 20-29 September 2006. This trip was organized by ICRISAT and CGIAR – PFU regarding prospects of pearl millet and sorghum for crop diversification and farmer livelihood improvement in the region. During this trip, promising sorghum and pearl millet populations for dual–purpose cultivation (both grain and stover) as well as some promising pearl millet populations for green forage production were identified.
 - From 14 - 20 November, CGIAR PFU and ICARDA-CAC office in Tashkent was visited by Dr. Henri Carsalade, President, Agropolis, when he and Mrs. Carsalade were on a private visit. The aim of his visit was to meet, beside management and staff of ICARDA-CAC and other CG Centers, the national agricultural research authorities, government officials and scientists. In Uzbekistan, Dr. Carsalade visited Uzbek Scientific Production Center of Agriculture in Tashkent, Uzbek Research Institute of Plant Industry and the national Gene Bank of Uzbekistan organized under this Institute.
 - In addition, a number of scientists from different CG Centers visited the region for technical backstopping of their respective research programs as well as to participate in various meetings, workshops and training programs.
 - Dr. George Kuo, Director on International Cooperation, AVRDC visited Tashkent to participate in the ‘First CAC Vegetable R&D Network Steering Committee Meeting’ and ‘Review and Planning Meeting in Vegetable Variety Selection in CAC’ organized jointly by AVRDC and PFU-CGIAR for CAC. This was an important event to meet NARS partners in the area of vegetable growing and to visit potential donors located in Tashkent.
 - Dr. Raj. Gupta, CIMMYT-India and Mr. S. Singh, manufacturer of Dashmesh zero-till and raised-bed planters from India visited ICARDA-Uzbekistan to discuss issues of improvement and manufacturing conservation tillage machinery in Central Asia for wide adoption of conservation agriculture technologies.
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Annex 1.

The list of newly released varieties, their seed availability and approximate area covered.

	Country	Name of variety	Available seed (ton)		Released year	Area covered (ha)		
			2005	2006	2005	2005	2006	
Wheat								
1	Georgia	Mtsheta-1	30	100	2002	30	500	
2	Armenia	Armcim	10	24	2006	50	90	
3	Azerbaijan	Azametli 95	1000	1800	2004	25 000	170000	
4	Azerbaijan	Nurlu 99	400	680	2004	30 000	50000	
5	Azerbaijan	Qobustan	25	50	2006	125	500	
6	Kyrgyzstan	Djamin	27	50	2004	300	420	
7	Kyrgyzstan	Zubkov	12	30	2004	100	200	
8	Kyrgyzstan	Azibrosh	20	60	2004	300	500	
9	Turkmenistan	Bitarap	6320	15 772	2004	300	9038	
10	Uzbekistan	Dostlik	7500	15 000	2002	12 000	20000	
11	Kyrgyzstan	Almira	2	5	2005	15	25	
12	Kazakhstan	Egemen	Just recently released in 2006					
13	Tajikistan	Norman	Just recently released in 2007					
14	Tajikistan	Alex	Just recently released in 2007					
Barley								
1	Armenia	Mamluk	1000	1100	2002	5000	6500	
2	Kyrgyzstan	Adel	6	5	2006	20	30	
Triticale								
1	Kyrgyzstan	Alesha	1.0	3.0	2005	10	100	
2	Kyrgyzstan	MISCIM	1.2	3.5	2005	10	100	
Chickpea								
1	Azerbaijan	Narmin	3.0	20.0	2005	20	43.0	
2	Georgia	Elixsir	8.0	16.0	2001	10	25.0	
3	Kazakhstan	ICARDA-1	2.5	6.0	2005	4	15.0	
4	Kyrgyzstan	Rafat	0.3	0.2	2005	1	2.0	
Lentil								
1	Georgia	Pablo	2.6	3.2	2001	8	12	
Soybean								
1	Uzbekistan	Ilkhom	Just recently released in 2006					
Grass pea								
1	Kazakhstan	Ali Bar	1.8	5.8	2005	5	18	

Annex 2

Human Resource Development Activities in 2006-2007

A. Genetic Resource Conservation

<i>Date and venue</i>	<i>Organization</i>	<i>Event</i>	<i>Participants</i>
3-24 May, 2006 Svalof Weibull, Sweden	Swedish Biodiversity Center and partners	International training course on “Genetic Resources and Intellectual Property Rights”	Two scientists from Uzbekistan and Tajikistan participated
11-13 May, 2006, Samarkand	PFU-CGIAR, Samarkand University and other partners	The Second national training course on PGR documentation	18 specialists from Uzbekistan
29 May – 2 June, 2006, Tbilisi	GCDT/ ICARDA	Regional workshop on ‘PGR Documentation	12 scientists from CAC
7-10 August 2006, Tashkent	IPGRI(BI)- Tashkent, UNDP, Westminster University	Training course on ‘PRA and Community Management’	More than 15 participants

B. Germplasm Enhancement

<i>Date and venue</i>	<i>Organization</i>	<i>Event</i>	<i>Participants</i>
2-15 May, 2006, Hyderabad	ICARDA-CAC	International training course on “Pearl Millet Improvement and Seed Production” organized by ICRISAT	One scientist from Uzbekistan participated
11-17 May, 2006, Tashkent	AVRDC-CAC	Training on “Methods of Managing Vegetable Crops”	One scientist from Tajikistan
15-27 May, 2006, Taiwan	AVRDC	International training Workshop on “Evaluation of Superior Vegetable Varieties”	One scientist from Armenia, one from Kazakhstan and one from Uzbekistan participated from CAC
May- July 16, 2006	MSU/ICARDA	Internship for IPM project staff at the MSU and the University of California	3 participants
May 31- June 9, 2006	ICARDA-CAC, CIMMYT and PBI, University of Sydney	Training course on Yellow Rust Management In Western Central Asia and the Caucasus”	20 participants
26 May – 3 June, 2006, Fergana valley	AVRDC-CAC	Training course on Growing Vegetable Crops	73 farmers

1-8 June, 2006, Tashkent	ICARDA, CIMMYT, PBI	A training course on “Yellow Rust Management in Western, Central Asia and the Caucasus”	20 participants from CAC
31 July-4 August, 2006, Tashkent	AVRDC(BI)- CAC	Training course on “Evaluation of Promising Varieties of Vegetable Crops in CAC”	10 specialists from eight CAC countries
7-9 August, 2006, Tashkent	AVRDC(BI)- CAC	A Review and Planning Workshop on Vegetables Breeding in CAC	20 specialists from eight CAC countries
Summer, 2006	ICBA	Training on methods of evaluation and utilization of halophytes and managing of soil salinity at the ICBA Headquarters, Dubai, UAE.	2 participants
20 August – 3 September, 2006, Suwon (Korea)	IRRI and RDA, Korea	Training workshop on “Rice technology transfer system in Asia”	One specialist from Uzbekistan participated
4-15 September, 2006, Tashkent	PFU-CAC, ICARDA and FAO	Training course on Quality Assurance in Seed Processing, Testing and Quarantine	21 participants from Uzbekistan
August 9, 2006 Tashkent, Uzbekistan	AVRDC PFU-CAC	First CAC Vegetable R&D Network Steering Committee Meeting for Central Asia and the Caucasus	28 participants
7-9 August, 2006, Tashkent, Uzbekistan	AVRDC(BI) PFU-CAC	Review and Planning Meeting in Vegetable Variety Selection in Central Asia and the Caucasus	28 participants
15 -27 May 2006, AVRDC HQ, Taiwan	AVRDC	Workshops on the Evaluation of Superior Vegetable Varieties	3 participants
2-15 May, 2006 ICRISAT, Hyderabad	ICRISAT	Training course on “Pearl Millet Improvement and Seed Production”	1 participant
July 31 – August 4, 2006, Tashkent, Uzbekistan.	AVRDC PFU- CAC	Regional Training Workshop on the Evaluation of Superior Vegetable Varieties for Central Asia and the Caucasus	10 participants

C. Soil and Water Management

<i>Date and venue</i>	<i>Organization</i>	<i>Event</i>	<i>Participants</i>
15-21 May, 2006, Tashkent	ICBA, ICARDA, IWMI	A training course on “Advances in Biosaline Agriculture with Reference to CAC”	44 scientists from eight CAC countries
30 June, 2006	Senate of the Republic of Uzbekistan, Ministry of Agriculture and Water Resources of Uzbekistan, ICARDA-CAC	Conference on “Modernization of Agriculture through introduction of new technologies in cotton and grain production: problems and their solutions”	40 participants from Uzbekistan
25-30 March, 2007, Tashkent, Uzbekistan	ICARDA/IWMI/ICBA/Tashkent Irrigation Institute	A training course on “Procedures and Tools for Salinity-related Data Processing and Statistical Analysis”	10 participants
April, 2006	ICARDA, IWMI, ICBA	Training course on “Evaluation of technologies Addressing Salt-prone Land and Water Resources”	16 participants from Central Asian countries
1-3 July, 2006, Urgench	ICARDA, IWMI, ICBA	Training course on “Evaluation of Technologies Addressing Salt-prone Land and Water Resources”	Two participants from Turkmenistan
28 August, 2006	Gulistan State University, IWMI, ICARDA, ICBA	Farmers’ Fair on “Technologies for Remediation of Saline Soils”	About 500 participants, including more than 400 farmers
15-24 December, 2006	IWMI-CAC	Training course on “Water Distribution and Performance Indicators”	More than 20 participants

D. English Language Training

<i>Date and venue</i>	<i>Organization</i>	<i>Event</i>	<i>Participants</i>
11 December, 2006 – 11 March, 2007, Tashkent	CGIAR-PFU and all Centers	English training course	20 participants from Azerbaijan, Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan